

CACTUS INTERTIE SYSTEM

CACTUS RADIO CLUB, INC.

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In The Matter Of:

Spectrum reallocation in the 2.30
through 2.45 GHz Frequency bands.

ET Docket No. 94-32

**Re: Reallocation from Government service to
Non- Government service of spectrum shared
by the Amateur Radio Service; and specifically
the impact of such reallocation on the activities
of the Cactus Intertie System.**

**Comments of the Cactus Radio Club, Inc., on the
FCC Notice of Inquiry, and comments in support
of those comments filed by the Southern California
Repeater and Remote Base Association (SCRRBA),
and the Amateur Radio Council of Arizona (ARCA)**

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The Cactus Intertie System and the Cactus Radio Club were founded in 1971 to construct and operate a system of interconnected remotely controlled amateur radio stations. Since our inception, we have constructed and now operate over 100 such stations in the Southwestern United States. These stations are located in the states of California, Arizona, New Mexico, Texas, Nevada, and Utah. Our present rate of construction averages 6 to 8 sites per year added to the network. These stations are interconnected by full time duplex radio paths operating in the 420-431, 902-928, 2300-2450 MHz frequency bands. This amounts to some 225 transmitters and associated receivers (terminals) just to provide the point-to-point connections between sites.

The Cactus System has over 1,300 members who utilize the system 24 hours a day. The system typically is used for relatively long distance communications. Most traffic flows between regions making very high traffic loads on the interconnecting "link" equipment. Hourly traffic between San Francisco, Los Angeles, San Diego, Phoenix, Albuquerque, El Paso, Fort Worth, Dallas, San Antonio, Las Vegas, and Salt Lake City is the normal usage of the system.

The system is also used for emergency inter-region communications. Neither the "Los Angeles (Northridge)" earthquake of 1994 nor the "San Francisco (Loma Prieta)" earthquake of 1989 interrupted any significant portion of this system. During those times of crisis, we provided communications not otherwise available. What may not be commonly known is that during a disaster of these proportions, the telephone companies suspend (often for several days) ALL incoming and most outgoing telephone traffic to entire regions many times larger than the actual affected areas. During these times, the Amateur Radio Operators inside the disaster area are the only reliable sources of communications. Our radio system provides a level of communications reliability and coverage impossible to otherwise obtain. The commercial power is usually off during disasters. This requires the use of battery operated radios. Through the use of our radio system, an amateur with a hand held transceiver can communicate reliably 24 hours a day noise-free with similar amateur stations all over the Southwest. We provide supplemental emergency communications for government officials as well as health and welfare communications for the citizens for several days after a major disaster. During the early stages of the recent Los Angeles earthquake, we provided FEMA officials in Arizona a way to communicate into the area. We handled several hundred health and welfare calls from worried relatives in Arizona, New Mexico, Nevada, and Utah.

Our system is by far the largest of its kind. There are many other similar systems in the Southwest. Most of these other systems are in the more populated areas. As all of these systems grew, the pressure for more frequencies for the interconnects or "links" grew. The initial systems placed their links on the 420-431 MHz band. This band has been full for many years in the major cities, and the congestion is growing in the larger communities. There is also tremendous pressure for more frequencies for "mobile relay" or "repeater" operation.

Cactus foresaw this increase in demand for link and mobile spectrum and in 1979, began a program of acquiring surplus commercial microwave point-to-point equipment suitable for conversion to the 2.3 GHz band. We reviewed the available spectrum and available equipment. We rejected the 1.2 GHz band for lack of suitable equipment. At that time, the 902-928 MHz band was not available. Viewed from today, this still seems wise. The 1.2 GHz band is rapidly filling up with both voice and television repeaters. The 902 MHz band is too narrow to be useful.¹ Unfortunately, this plan was violently de-railed by the loss of 2.310 - 2.390 GHz to aircraft flight test. The equipment we had acquired was simply too difficult and too expensive to re-design to allow operation in the remaining portions of the 2.3 GHz band. We scrapped 23 racks full of microwave equipment!

Needless to say, this setback diminished both our enthusiasm and our pocketbooks! By 1988, we saw that we could not survive much longer shoe-horning more and more 420-431 MHz channels in the now even smaller spectrum (Amateur TV needed some, too!). We began another program of acquiring surplus 2 GHz microwave equipment suitable for use in the remaining 2.3 GHz band. This meant we had to reject most of the easily available equipment that was designed for very high density routes. The bandwidth of such equipment would not fit in the remaining slice of band left to us.

In 1992, we joined with many other users of the Amateur microwave bands and participated in a re-planning of our microwave spectrum. This was sponsored by the Southern California Repeater and Remote Base Association (SCRRBA). The existing activity of ours and many others was taken fully into account. This set in place the framework that allows us to plan intelligently for the future.

This now stable band use structure also produced considerable interest in cooperative ventures. There are quite a number of parallel "link" paths presently being used by amateur groups. Installation of a single pair of 2.3 GHz terminals between two commonly used sites could eliminate as many as 10 sets of 420-431 MHz (voice) terminals. The rapidly expanding use of Packet Digital radio can easily occupy another 3 to 10 channels in equivalent bandwidth. This improvement in spectrum efficiency is possible only if we can build on a stable platform. No-one wants to be dependent upon spectrum that may vanish at the drop of a hat and without consultation with or compensation of the existing users!

At this writing, Cactus has 6 terminals operating on 2.3 GHz. All of these are on 2.306-2.310 GHz paired with 2.396-2.400 GHz. We have approximately 30 more terminals in various states of modification. These are being prepared for use on the 2.300-2.303, 2.305-2.310 GHz segments which are paired with 2.390-2.400 GHz. Much of this equipment is 1 watt transmitters, 10 dB noise figure receivers, and 800 KHz occupied bandwidth. Antennas in use are 6 foot dishes, and on some paths horns will be used. Some of our longer paths will require substantial effort to make them reliable. We expect about one-third of the paths will require 20 watt transmitters, 2 dB noise figure receivers, 10 foot dishes, and 200 to 300 KHz occupied bandwidth.²

¹ This topic is explained in some detail in the SCRRBA comments on this docket

² See the SCRRBA comments for more extensive data on types of point-to-point links

We purchased this equipment as-is surplus. We are putting in hundreds of work hours to modify the gear to work in our band and be suitable for our use. We estimate that we have spent about \$10,000 acquiring equipment and parts. Another \$50,000 will have to be spent over the next 5 to 10 years. This money is combined with a huge investment in labor. We estimate that it would cost approximately \$20,000 PER TERMINAL³ to purchase replacement equipment for use on another Amateur microwave band. We also estimate that use of 5.7 GHz would nearly double the number of hops required on 2.3 GHz. (There is virtually no equipment available for 3.3 GHz.)

The total of these figures is \$120,000 to replace the equipment presently in service, and about another \$450,000 to replace the equipment under construction. These are small numbers for the Government or for a "Baby-Bell" sized entity. They are absolutely astronomically huge for us!

Must we now throw away another huge investment in time and money?

Reviewing the sequence of events on the re-allocations in 2.3 GHz brings up several interesting questions. The mandate in the Budget Act to make government spectrum available to non-government use has with it a requirement to evaluate the impact on existing use of the spectrum, and to compensate those displaced. Detail of testimony to the NTIA's Spectrum Policy and Planning Committee by the ARRL indicates that the NTIA was made aware of the existence of amateur operations in the 2.3 GHz band, and that those operations cannot be quantified by simply reading the "Repeater Directory." It appears that the NTIA stopped its investigations at this point and said that "activity was difficult to quantify" This does not even begin to answer the mandates in the Budget Act. The NTIA did not document in their preliminary report any study of spectrum sharing between the amateur and commercial services. The NTIA did not document any research into replacement spectrum for amateur operations. Both of these items are specifically spelled out in the Budget Act. We note with dismay that the spectrum utilization by the amateur community today is to be compared with some future commercial utilization without regard to growth of the amateur usage. The NTIA failed to even complete this evaluation, even using the unbalanced weighting of activities called for in the Budget Act.

The NTIA has failed its instructions in the three areas specifically intended to protect amateur radio operations:

- 1: "... avoid disruption of amateur use of Government frequencies..."⁴
- 2: "...consider the extent to which commercial users could share with amateur users.." ⁵
- 3: "... Determine substitute frequencies .. if reassignment disrupts the use of Government frequencies by amateur users.." ⁶

³ The NTIA Preliminary Spectrum Reallocation Report Section 2 Page 2-35 Paragraph 3 indicate much higher costs to the Government for similar fixed point-to-point microwave equipment

⁴ Omnibus Budget Reconciliation Act of 1993, Section 113(a)(1)(C)(iii)

⁵ Supra Section 113(a)(3)(C)

The failure of the NTIA to "follow through" and evaluate the spectrum use, sharing, and potential for new spectrum is particularly puzzling. The NTIA covers the topics of amateur operations and amateur emergency operations accurately and in some detail. The picture they portray is favorable and they note that the amateur community has a history of satisfactory sharing of Government spectrum⁷. We cannot understand why the amateur community is accurately recognized qualitatively, and effectively ignored quantitatively. We note that this is the fifth time in the last 2 decades that very substantial amounts of amateur-Government shared spectrum has been withdrawn from amateur service.⁸ It is time for this to stop!


We submit that the failure of the NTIA to follow the directives in the Budget act invalidate the availability of the spectrum 2.300-2.310; 2.390-2.400; 2.402-2.417 GHz inclusive. If the FCC reassigns any of this spectrum to other than Amateur operations, they will be equally guilty of violating the instructions in the Budget Act.

These matters are dealt with in considerably more detail in the comments filed by SCRRBA, and we support those comments. Therein are material and specific analyses of existing and proposed operations. Therein is an outline of a basic structure that can be used to find replacement spectrum. We ask that you withhold reallocation of any of this spectrum to other than amateur operations until such time as the questions outlined above are satisfactorily answered. We are reasonably certain that, if reasonable replacement spectrum is found and allocated, the amateur community will SUPPORT the reallocation plan, rather than OPPOSE it as we do now.

The SCRRBA comments speak to the specific points of inquiry of the NOI, and we concur with those comments.

Please consider the facts outlined above and in the SCRRBA comments when this matter is passed forward to Proposed Rulemaking. We would much rather support a mutually beneficial solution than oppose this simple "takeaway" of spectrum from the amateur radio service.

Thank you for your consideration,


H. Denny Chase
Chairman of the Board
Cactus Radio Club, Inc.

⁶ Supra Section 114(b)(2)(E)

⁷ NTIA Preliminary Report, Section 3 page 3-6 paragraph 1 and associated footnote 20

⁸ 2.310-2.390 MHz; 1.215-1.240 MHz; 220-222 MHz, 420-430 MHz (portions of the country); and the present reallocation attempt.